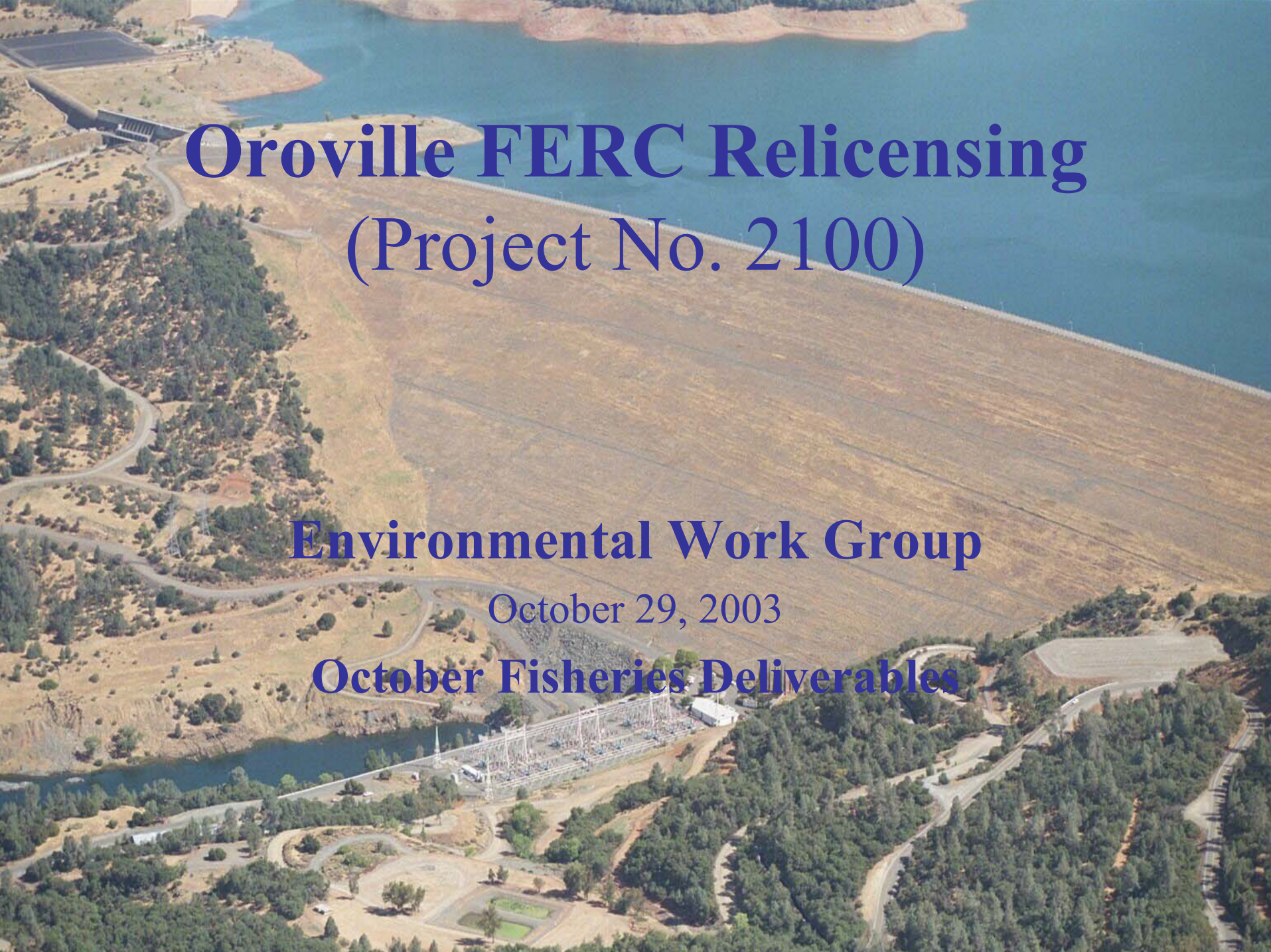


Oroville FERC Relicensing
(Project No. 2100)

Environmental Work Group

October 29, 2003

October Fisheries Deliverables

Timing, Thermal Tolerance Ranges, and Potential Water Temperature Effects on Emigrating Juvenile Salmonids (Chinook and Steelhead) in the Lower Feather River

SP-F10 Task 4B

Objectives

- Determine Emigration Time Period
- Determine Thermal Tolerance Range Indices
- Assess Spatial and Temporal Water Temperature Profiles of the Lower Feather River
- Evaluate Potential Impacts from Project Activities to Emigrating Juvenile Salmonids from Thermal Stress Loading

Design and Methods

- Study Area – Feather River from the Diversion Dam to Confluence with the Sacramento River
- Emigration Timing
  - Painter (1977) Fyke Net Surveys
  - DWR Seining Surveys
  - DWR Rotary Screw Trap Surveys
  - DWR Snorkel Surveys
- Thermal Tolerance Ranges
  - Literature Review

Design and Methods Continued

- Water Temperature Profiles
  - 24 Total Water Temperature Data Loggers
    - 11 LFC, 13 HFC
  - Daily Maximum, Mean, and Minimum

Results

- Emigration Timing
- Thermal Tolerance Indices
- Water Temperatures With Respect to Juvenile Steelhead
- Water Temperatures With Respect to Juvenile Chinook Salmon

Emigration Timing

Juvenile Steelhead

- February through September
- Peak Emigration March through Mid-April

Juvenile Chinook Salmon

- Mid-November through June
- Peak Emigration January through March

Thermal Tolerance Range Index Categories

Juvenile Steelhead

- **Suitable**

  $X \leq 55^{o}$ F (12.8^{o} C)
- **Potential Sub-Lethal Effects**

  55^{o} F $< X \leq 65^{o}$ F
- **Not Suitable**

  65^{o} F (18.3^{o} C) $< X$

Juvenile Chinook Salmon

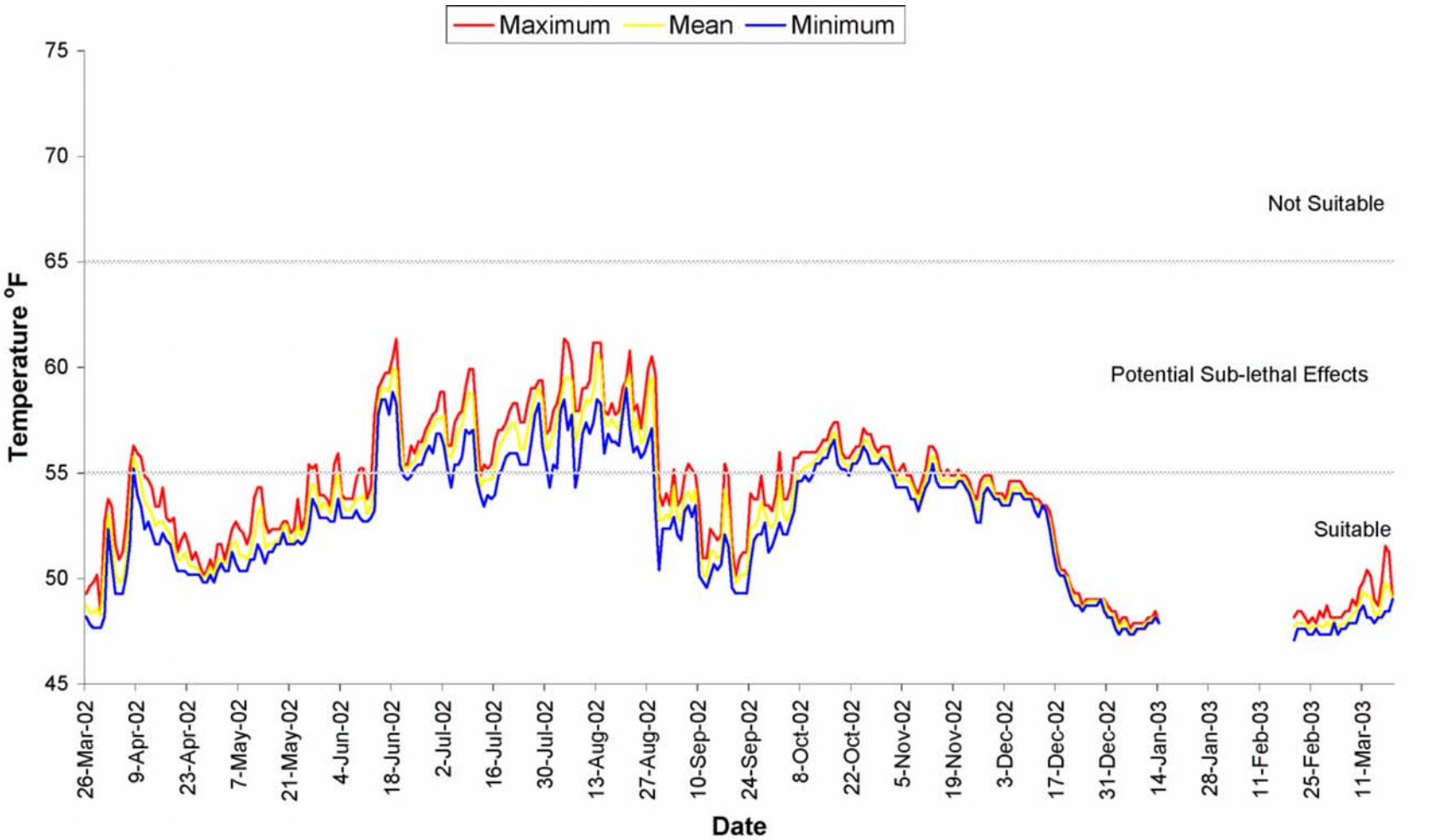
- **Suitable**

  $X \leq 62.6^{o}$ F (17^{o} C)
- **Potential Sub-Lethal Effects**

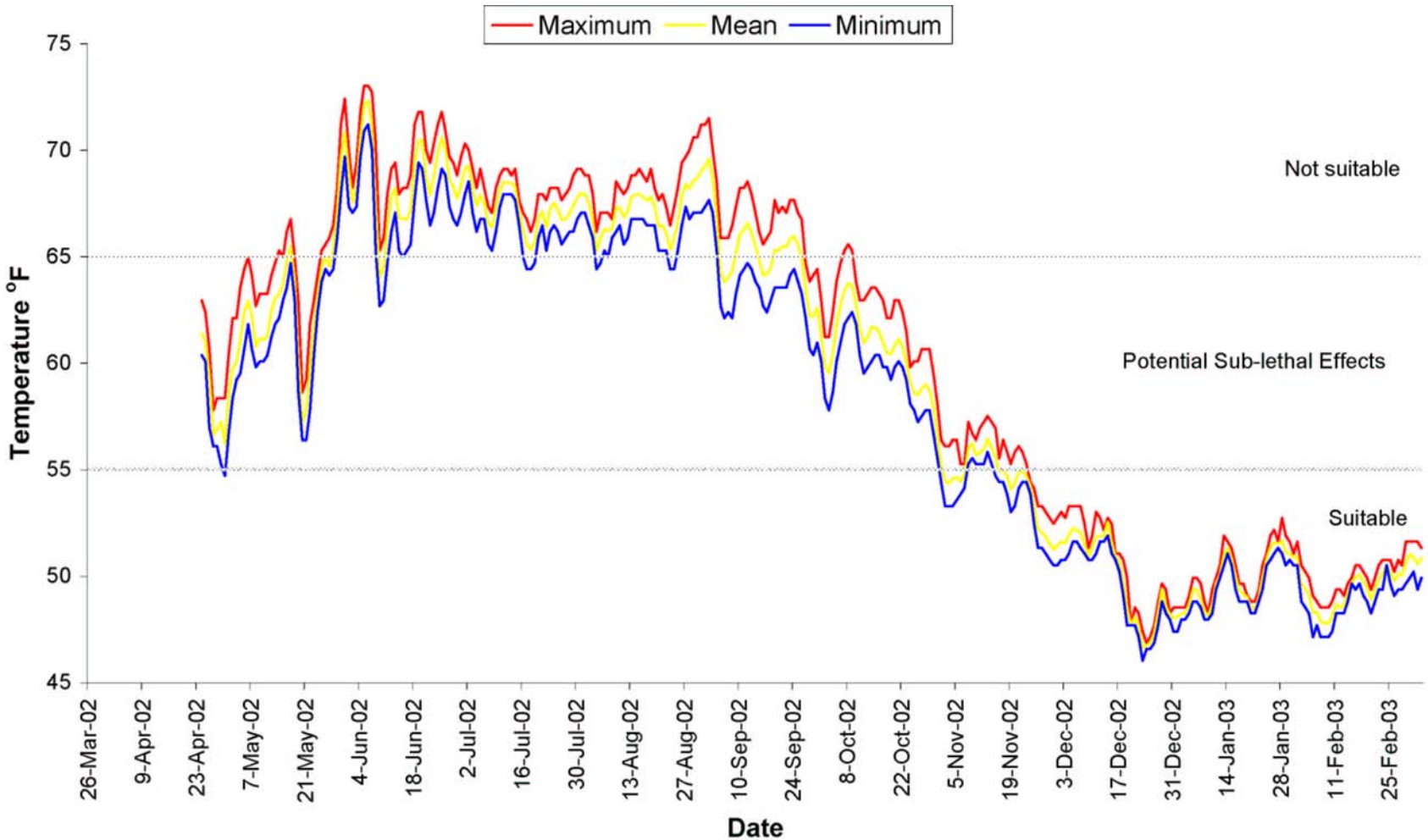
  62.6^{o} F $< X \leq 68^{o}$ F
- **Upper Incipient Lethal Effects**

  68^{o} F (20^{o} C) $< X$

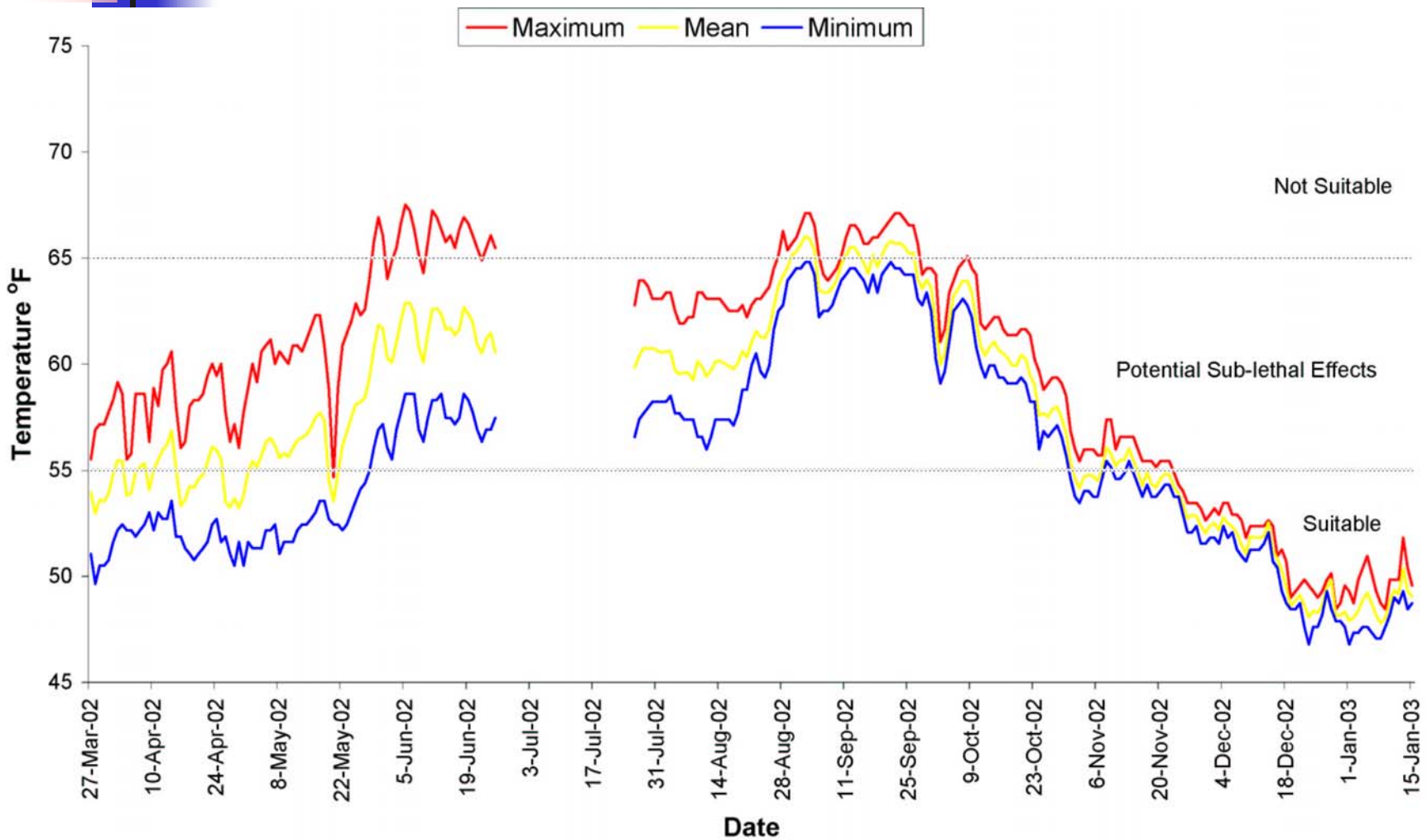
Juvenile Steelhead and Water Temperatures in the Low Flow Channel



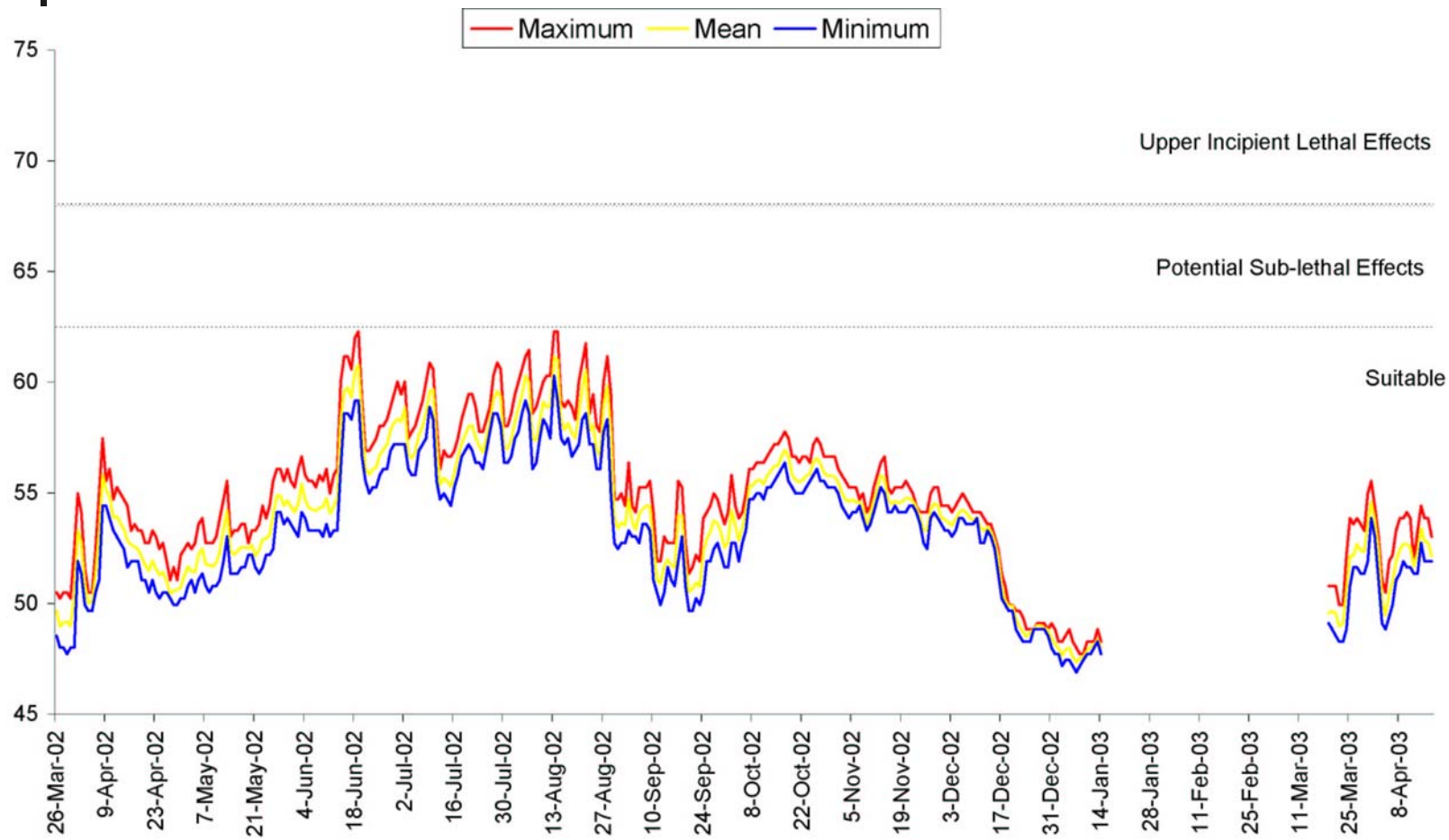
Juvenile Steelhead and Water Temperatures in the High Flow Channel



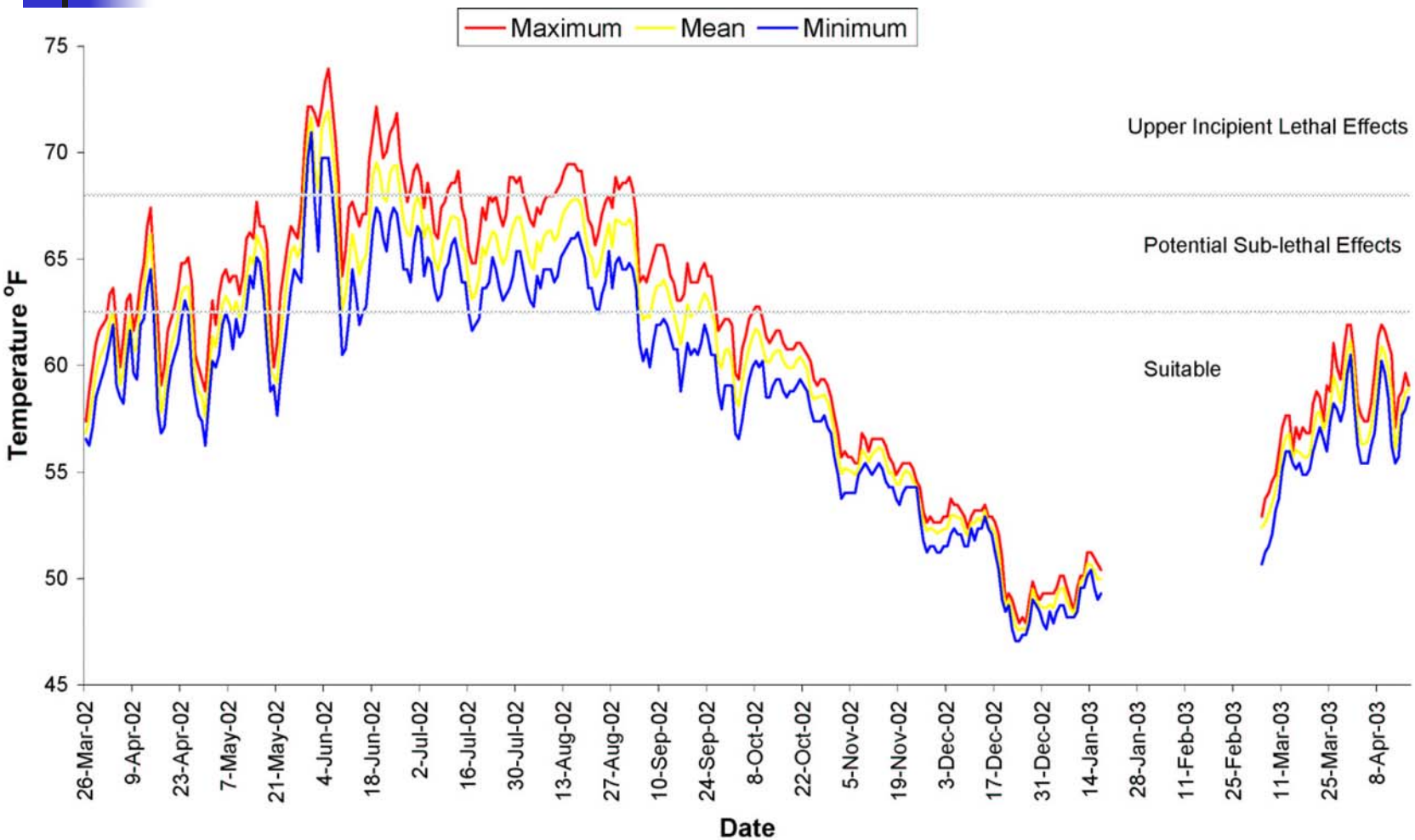
Water Temperature Profile at the Mouth of the Yuba River RM 27.5



Juvenile Chinook Salmon and Water Temperatures in the Low Flow Channel



Juvenile Chinook Salmon and Water Temperatures in the High Flow Channel



Conclusions

- Elevated water temperatures in the lower Feather River may affect emigrating juvenile steelhead more than emigrating juvenile Chinook salmon.
- Using index water temperatures as indicators of suitability, water temperatures in the LFC appear to be more suitable for emigrating salmonids than water temperatures in the HFC.
- However, the project's ability to manipulate water temperatures through flow releases decreases with downstream distance from Oroville Dam.
- In the HFC during the warmest months of the year, cold water inflow from the Yuba River may provide a localized thermal refugium.